

An additional source of possible radiation damage to electronic parts through non-ionizing energy loss should be taken into account for the Europa Orbiter instruments. The following change should be made to the Environmental Requirements document in the Program Library.

Add new Section 3.4 - Non-Ionizing Energy Loss (NIEL) Radiation Environment for Europa

Non-Ionizing Energy Loss (NIEL) occurs within semiconductor materials when charged particles create permanent lattice structure defects through collisions with nuclei in the semiconductor. The charged particle environment for the Europa Orbiter may cause significant NIEL within susceptible semiconductor materials (such as bipolar linear and MOSFET devices), resulting in additional parametric drift through the end of mission life. In this document, NIEL is expressed in terms of an equivalent fluence of 1-MeV neutrons/cm<sup>2</sup>. NIEL can also be expressed in units of MeV/gm. A NIEL of 1 MeV/gm is equivalent to the NIEL caused by a fluence of 490 1-MeV neutrons/cm<sup>2</sup>.

The radiation from the spacecraft RTGs plus the external Jovian electron, Jovian proton, and solar flare proton radiation environments for three representative mission trajectories have been generated for the Europa Orbiter and have been used to generate NIEL fluence versus aluminum shielding thickness curves. The results are shown in Figure 26.

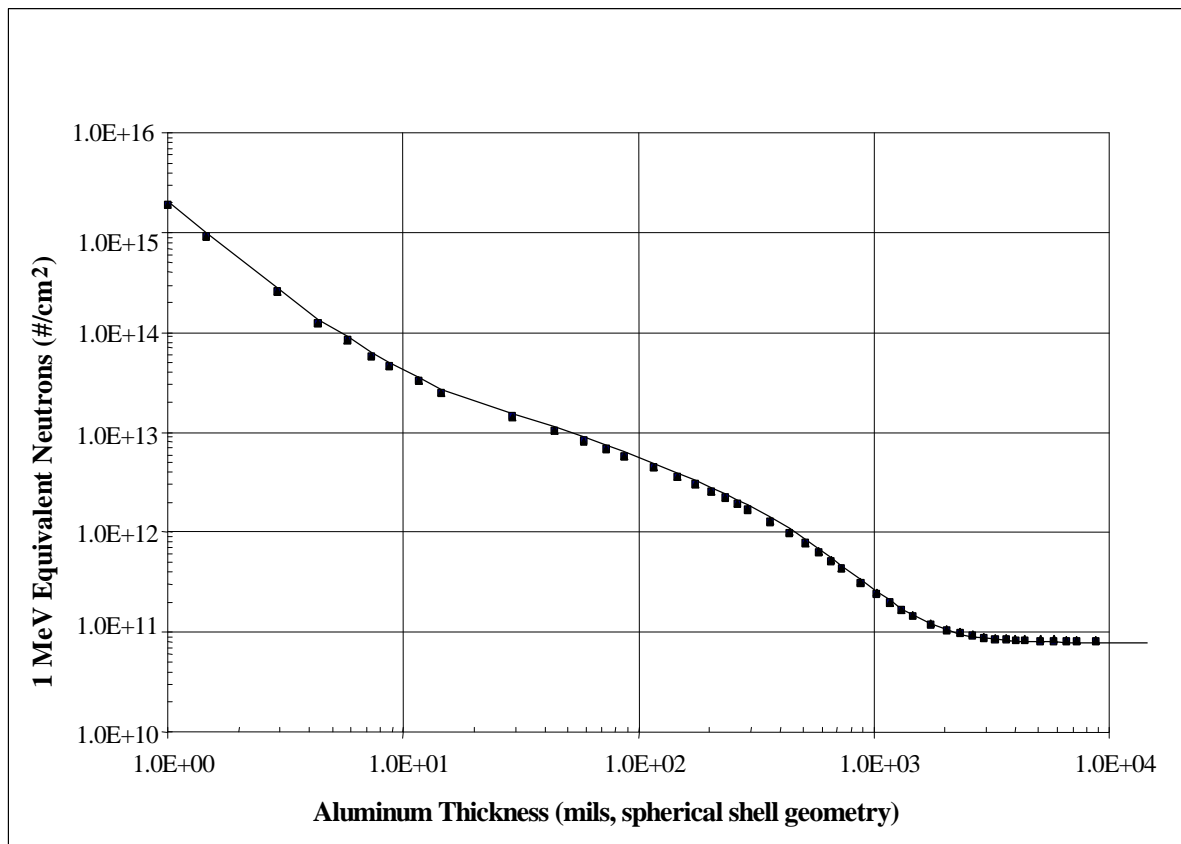


Figure 26: Europa Orbiter NIEL Fluence vs. Shield Thickness